STOCK PRICES AND EXCHANGE RATE VARIABILITY IN NIGERIA ECONOMETRIC ANALYSIS OF THE EVIDENCE

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Abstract

This study examines the dynamic interaction between stock prices and the Naira-US$ exchange rate in Nigeria using co-integration and the Granger-Sim causality methodology. The results portray the fact that whenever there is a change in the Naira-US$ exchange rate, stock prices react in tandem. The empirical analysis thus provides evidence of a positive co-integrating relationship between the Naira-US$ exchange rate movement and the Nigerian stock market prices with bi-directional Granger causality found to exist between stock prices and exchange rate in Nigeria during the period researched. The results accordingly lend empirical support to the fact that the Naira-US$ exchange rate movement and the Nigerian stock exchange market interacted in a manner that is simultaneously consistent with the predictions of the flow and stock theories.

Keywords: Naira-US$ exchange rate, Stock prices, Granger-Sim causality, Flow model, Stock model

Background

Nigeria's exchange and trade system have been liberalized extensively since 1980's. Indeed, the country adopted a flexible exchange rate system in adherence to the Bretton Woods Agreement. A flexible exchange rate system is one with which the exchange rate at any time is determined by the interaction of the market forces of demand and supply for foreign exchange. We could have a clean float, that is, no government intervention or dirty float which allows government intervention. Proponents of the flexible exchange rate regime argued that it permits a continuous response to changes in the fundamentals of the economy, neutral with respect to inflation, causes higher growth and leads to BOP equilibrium without inducing demand restraints and protectionism that may cause further distortions in resource allocation (Dornbusch and Fischer, 1980). As it were, remarkable changes in exchange rates may occur every day (Oguzhan and Erdal, 2009). According to Nieh and Wang (2005), such changes call for adjustments in costs or gains of multinational companies and thereby increase exchange spotlight to financial institutions. The Nigerian Stock Exchange which often provides avenue for corporate entities to raise long-term finance has exhibited oscillation of movements that have culminated in the decline of returns and capital depreciations across all sectors in the country. Market participants have attributed the trend to fright trading.

It is widely believed that changing exchange rates affect the competitiveness of firms engaged in international competition (Stavárek, 2005). Even firms whose entire operations are domestic may be affected by exchange rates, if their input and output prices are influenced by currency movements (Adler and Dumas, 1984). Volatility in foreign exchange rate and deviation from purchasing power parity became persistent in the Nigerian economy. The Nigerian economy has suffered from economic crises in recent times. Firms operating in the country are affected by these hostile economic conditions as they faced higher business risk and foreign exchange risk. Volatility in exchange rate is a major source of macroeconomic uncertainty affecting firms. Such volatility can be traced to the rapid expansion in international trade after the 1970's. The firm's exposure to exchange rate risk increased.

Empirical investigations of the relationship between exchange rate variability and stock prices have in the past been the concern of many economists especially in the developing countries of the world. Even when economic theory postulates that changes in foreign exchange influences stock price by affecting cash flow, investment and profitability of firms, the empirical consensus is still indecisive. In what follows, many empirical tests have been conducted in order to unveil the relationship between exchange rate variability and the response of stock prices. However, the arrow of causation still remains vague in both theory and empirics. In this study therefore, we are set to explore the true causal relationship between stock prices and the Naira-US$ exchange rate. The apposite empirical question in this regard becomes, how are changes in exchange rates and stock prices related in the Nigerian economy? The paper is organized as follows: Section two contains a succinct trend analysis of the Nigerian stock market and the Naira-US$ exchange rate. Section three reviews the literature. Data, methodology and estimation technique are discussed in section four. Results are analyzed section five. The last Section six concludes the paper.

The Nigerian Stock Exchange And Exchange Rate: Trend Analysis

Between 1970 through to 1980, Nigeria witnessed oil boom. In 1980 Nigeria became an oil-exporting country faced with high capital inflows which resulted in the appreciation of the naira. The CBN accordingly implemented a system of gradual appreciation of the naira against the US dollar in an attempt to have a Naira exchange rate that could reflect the Nigerian balance of payments position (Oyejide, 1986). The oil boom came to an end by 1983 and the prevailing currency appreciation impeded the growth of the economy particularly in the agricultural sector. In 1986, Nigeria implemented the IMF/World Bank imposed Structural Adjustment Program (SAP) which mandated a market oriented approach to exchange rate determination. This decision was informed by the compromised balance of payments position as well as the country's declining external reserves level. Both the nominal and the real exchange rates were depreciated so as to align them to their equilibrium levels (Obadan, 1994). The institutional framework in place in 1986 was the second-tier foreign exchange market (SFEM) which implemented a dual exchange rate system and in 1987 the two rates merged at the rate of 3.74 naira for 1 USD. A Dutch Auction System (DAS) was introduced in 1987 in order to improve the level of bidding. The SFEM and DAS were then replaced by the Foreign Exchange Market (FEM) in 1987, in a bid to reduce the multiplicity of the exchange rates, as well as ensure a the depreciation of the currency. In 1989, the Bureau de change and the Inter-bank Foreign Exchange Market (IFEM) were introduced to the market, in order to cater for the needs of small end-users. In 1990, the IFEM was altered to accommodate the reintroduction of the DAS (Odubogun, 1995).

From 1992 to 1993 the exchange rate system in Nigeria was deregulated and this was further enhanced by realigning the official exchange rate with the exchange rate in the parallel market. In 1994 the Autonomous Foreign Exchange Market (AFEM) replaced the IFEM. The AFEM was established to ensure that foreign exchange rate was sold at a market determined price, by authorized dealers. The exchange rate was further depreciated and at the close of 1995, 1 USD was equal to 82 naira in the autonomous part of the market. This however widened the gap between the parallel and official exchange rate. The further devaluation of the naira in 1998 fostered a market-oriented exchange rate arrangement which led to a fall in the premiums being captured in the parallel market and therefore narrowed the gap between the official and parallel market exchange rates. In 1999 the IFEM was reintroduced in order to improve inter-bank activities in the market. The exchange rate continued to depreciate and in 2001, US dollar was equal to 111 naira (CBN, 2010). In order to cope with the demand pressure on the foreign exchange rate as well as the falling external reserves, the CBN reintroduced the DAS which replaced the IFEM in 2006 and the official and parallel market rates in Nigeria merged. The exchange rate however continued to appreciate throughout 2006 owing to the high revenues from the high crude oil prices internationally (Aliyu, 2007). Despite various efforts by government to maintain exchange rate stability, the Naira continued to depreciate against the US dollar. For instance, the naira depreciated from N0.6100 in 1981 to N2.0206 in 1986 and further to N8.0378 in 1990. Although the exchange rate became relatively stable in the mid-1990s, it depreciated further to N102.1052, N120.9702 and N133.5004 in 2002, 2002, 2004 respectively. Thereafter, the exchange rate appreciated to N132.147, N128.6516 and N117.968 in 2005, 2006, and 2007 respectively. In early 2009, the Naira depreciated to N170 against the US dollar. While some have attributed the recent depreciation to the decline in the nation's foreign exchange reserves, others argued that the activities of speculators and banks are answerable for the recent decline in the value of the naira.

The Nigeria stock market has witnessed significant developments since its inception. Some of the major developments targeted towards an efficient stock market include the introduction of second Tier Security Market (SSM) in 1985 to cater for the financial needs of small and medium scale enterprises. In 1992 the Central Securities Clearing system (CSCS) was incorporated as the official central clearing and depository of the Nigerian Stock Exchange Management System (SEMS) which emphasizes the immobilization of shares certificate in a central depository bank. Besides, the market recorded significant strides in the privatization of state owned enterprises as part of the implementation of the Structural Adjustment Programme (SAP) in 1986. Even though the stock market provided Nigerian industries the opportunity to operate effectively through the provision of long-term loans which aided their financial strength and also enhance their operation which result in high level of productivity, activities on the floor of the Nigerian Stock Exchange are mixed, as the market capitalization grew by 36.6 per cent, to close at N11.2 trillion, while the all-share index declined by 1.6 per cent to 24,980.20 at end-June 2011 (Sanusi, 2012).

Literature Review

The empirical literature on the relationship between exchange rate movement and the response of stock prices is vast and the empirical evidence has been documented for different countries. For example, Aggarwal (1981) study was done for the US, Hatemi-J and Irandoust (2002) study was carried out for the Sweden, Wu (2000) for Singapore, Tsoukalas (2003) examines the relationship between stock prices and macroeconomic for the Cypriot economy, Sevuktekin and Nargelecekenler (2007) study was done for the Turkish economy, Kim (2003) did his study for the US economy, the study by Ibrahim and Aziz (2003) was done for Pakistan, India, Bangladesh and Sri Lanka, Malaysia, Nieh and Lee (2001) was done for G-7 countries, Smyth and Nandha (2003) was studies by Ozair (2006) and Vygodina (2006) examines the causal relationship between stock prices and exchange rates in the were carried out for the US, Abdalla and Murinde (1997) study was done for India, Korea, Pakistan and the Philippines, Muhammad and Rasheed (2002) study was done for Pakistan, India, Bangladesh and Sri Lanka, the study by Doong et al. (2005) was done for six Asian countries namely, Indonesia, Malaysia, Philippines, South Korea, Thailand, and Taiwan, Aziz (2003) did his study for Malaysia, Pan et al. (2007) was carried out for East Asian countries, Ramasamy and Yeung (2005), was done for Asian economies, Sevuktekin and Nargelecekenler (2007) carried out for Turkey, Soenen and Hennigar (1988) study was carried out for the US, Erbaykal and Okuyan (2007) was done for Turkey, Yu Qiao (1997) was done for Hong Kong, Ajayi et al. (1998) was done for Asian emerging markets and Granger et al. (2000) was focused on the interaction between stock and currency markets in Hong Kong, Indonesia, Japan, South Korea, Malaysia, the Philippines, Singapore, Thailand and Taiwan

Some studies found positive effects of exchange rate volatility on the activities of stock markets namely, Aggarwal (1981), Hatemi-J and Irandoust (2002), Tsoukalas (2003), Sevuktekin and Nargelecekenler (2007) etc. Others found negative effects of exchange rate volatility on the activities of stock markets, Soenen and Hennigar (1988), Kim (2003), Ibrahim and Aziz (2003) etc. There are studies that found no causal relationship between stock prices and exchange rates namely, Nieh and Lee (2001), Smyth and Nandha (2003), Ozair (2006). For some studies, the empirical evidence on the relationship between exchange rates on stock prices is mixed; such studies include Vygodina (2006), Abdalla and Murinde (1997), Ajayi et al. (1998), Muhammad and Rasheed (2002), Wu (2000), Doong et al. (2005), Pan et al. (2007) etc. There are studies whose empirical evidence on the causal relationship between exchange rates and stock prices is bi-directional, these studies are those of Doong et al. (2005), Ramasamy and Yeung (2005), Sevuktekin and Nargelecekenler (2007), Pan et al. (2007), Erbaykal and Okuyan (2007) etc. Also, for some of the studies, the empirical evidence on the causal relationship between exchange rates and stock prices is uni-directional namely, we have the studies by Abdalla and Murinde (1997), Yu Qiao (1997), Ajayi et al. (1998) and Granger et al. (2000) etc.

Theoretical Framework And Model Specification

Two theoretical frameworks for establishing a relationship between exchange rate and stock prices are discernible. First, is the “flow-oriented” economic theory as captured in the goods market model[50] (Dornbusch and Fisher 1980), which states that exchange rate movements cause stock price

[50] This model is built on the macro view that as stock prices represent the discounted present value of a firm’s expected future cash flows, such that any event that affects a firm’s cash flow will be reflected in the firm’s stock price if the market is efficient according to the Efficient Market Hypothesis.

movements. In effect, “flow theory” postulates ‘uni-directional’ causality running from exchange rates to stock prices, or at best, exchange rate ‘Granger-cause’ stock price and that the relationship is positive. For the flow-oriented models, the manner in which currency movements influence firm’s stock price is a function of the characteristics of that firm. According to Franck and Young (1972), changes in the value of the exchange rate alter the value of the multinational’s foreign firms, showing up as a profit or loss on its books which would then affect its share price. Economic theory also suggests that under a floating exchange rate regime, exchange rate appreciation reduces the competitiveness of export markets and impacts negatively on the domestic stock market. Conversely, if the country is import denominated, exchange rate appreciation may have positive affect on the stock market by lowering input costs (Yau, Hwey-Yun and Nieh, Chien-Chung, 2006).

Second, is the “stock-oriented economic theory” as captured in the portfolio balance model which postulates a negative relationship between stock prices and exchange rates (Branson et. al 1977). The crux of the theory is that a rise in domestic stock prices would attract capital flows, which increase the demand for domestic currency and cause exchange rate to appreciate. In contrast to “flow oriented” models, “stock-oriented” or ‘portfolio balance theory postulate that movements in stock prices Granger-cause movements in the exchange rate via capital account transactions. The degree to which stock oriented models explain currency movements is a function of stock market liquidity. Accordingly, while the flow theory holds that exchange rate movement causes stock prices to oscillate, the stock theory states that exchange rates are determined by market mechanism. In other words, stock price is expected to affect exchange rate with a negative correlation since a decrease in stock prices reduces domestic wealth, which leads to a fall in domestic money demand and interest rate. Besides, the decrease in domestic stock prices induces foreign investors to lower demand for domestic assets and domestic currency. These shifts in demand and supply of currencies cause capital outflows and the depreciation of domestic currency[51]. Also, when stock prices rise, foreign investors become willing to invest in a country’s equity securities and so, these investors derive paybacks from international diversification thereby inducing capital inflows and an appreciation of the currency (Granger et al., 2000, Caporale et al., 2002).

[51]A falling home currency promotes the competitiveness of firms in home country by allowing them to undercut prices charged for goods manufactured abroad (Stavárek, 2005).

Empirical Model

In this study, the following dynamic bivariate structural *VAR* system without exogeneity or exclusion restrictions is specified:

$$Y_{1t} = \phi_{10} + \delta_{12}Y_{2t} + \phi_{11}Y_{1,t-1} + \phi_{12}Y_{2,t-1} + \upsilon_{1t}$$

$$Y_{2t} = \phi_{20} + \delta_{21}Y_{1t} + \phi_{21}Y_{1,t-1} + \phi_{22}Y_{2,t-1} + \upsilon_{2t} \qquad (3.1)$$

In this *SVAR* model, both variables of stock market and exchange rate are endogenous and the lag structure is symmetric across equations. What distinguishes the equations from one another is the uncorrelated $\upsilon's$. The reduced-form for this structural system is given as:

$$DY_{1t} = \Gamma_0 + \Gamma_1 Y_{t-1} + \upsilon_t$$

$$Where\, D = [D_{ij}], D_{11} = D_{22} = 1, D_{12} = -\delta_{12}, D_{21} = -\delta_{21} \qquad (3.2)$$

This is the structural form of the VAR. Then, pre-multiplying both sides of equation (3.2) by D^{-1} yields the pseudo SVAR model:

$$Y_t = A_0 + A_1 Y_{t-1} + \mu_t$$

$$Where\, A_0 = D^{-1}\Gamma_0,\ A_1 = D^{-1}\Gamma_1, \mu_t = D^{-1}\upsilon_t \qquad (3.3)$$

Equation (3.3) is the standard reduced-form *SVAR* that is subject to estimation in this study. The thrust of the pseudo *SVAR* model is to ascertain how Y_{1t} and Y_{2t} respond over time to υ_{1t} and υ_{2t} shocks. The empirical procedure is to introduce a one-time υ_1 shock while holding υ_2 fixed. In what follows, we used the inverse of *D*-hat, $(\hat{D}^{-1})$ to translate the υ_1 shock into a μ shock and thereafter, use the *M-hat*, $(\hat{A})$ to simulate the response of the $Y's$ to the μ shock.

Data, Methodology And Estimation Technique

The methodology of the paper resides on conducting the following tests, unit root, co-integration test, Granger-Sim causality test, Wald test, Exclusion test and estimating the *SVAR* model. This study employs information criteria tests to ascertain the optimum lag length. An *Augmented Dickey-Fuller (ADF)* due to Dickey-Fuller (1979) and the *Phillips-Peron (PP)* due to Phillips and Peron (1988) tests were performed on the variables. *ADF* test are performed on the basis of the following equation:

$$\Delta Y_t = \Im + \beta T + (1-\delta)\Delta Y_{t-1} + \sum_{j=1}^{p}\phi_i \Delta Y_{t-j} + \upsilon_t \qquad (3.4)$$

Where Y_t is the variable tested for unit root, Δ is the first difference operator $\Im$ is the constant term, *T* is a time trend and *p* is the number of lags.

The null hypothesis is $H_0 : \delta = 1$, which implies that time series Y_t is non-stationary. Therefore when the null hypothesis is rejected, it indicates that Y_t has no unit root and is indeed stationary. Lag length is selected by minimizing the information criterion, *AIC*. Also, whether residuals are white noise is taken into consideration in selecting proper lag length. Rejecting null hypothesis requires that the calculated test value is greater than critical values calculated from MacKinnon (1991). The *PP* test was performed by utilizing the *ADF* test equation without the non-augmented form such as $\Delta Y_{t-j} \forall j = 1, 2, 3...$

The study also tested for co-integration using the Johansen's (1988) and Johansen and Juselius (1990) modus operandi. Co-integration techniques allow one to establish if the variables share a long-run relationship. In this methodology, trace (λtrace) and maximum eigenvalue (λmax) statistics are computed, proposed by Johansen (1988) and Johansen and Juselius (1990). When performing λtrace and λmax test, the null hypothesis that there are *r* or fewer co-integrating vectors are tested against at least *r + 1* co-integration vectors and *r + 1* co-integrating vectors, respectively. After applying co-integration test, if it is concluded that two series are co-integrated, error correction models are appropriate to investigate causality relationship. In case series are integrated of different orders, for example *I(0) and I(1)* or are not co-integrated, it is then viable to investigate the causality via error correction model estimation.

The study explores the Granger-Sim[52] causality between all-share price index and the Naira-US$ exchange rate. Given the different theoretical linkages regarding the relationship between exchange rate and stock prices, it is apparent that there are diverse channels by which stock exchange and currency markets can interact. This makes empirical discovery of the arrow of causation between stock prices and the Naira-US$ exchange rate predominantly motivating and paramount. Moreover, the evidence provided by the literature on the interaction is mixed in addition to the fact that economic theories underlying both the goods market and portfolio models are different. To analyze Granger-Sim causality between exchange rate and stock market price, the following unrestricted *VAR* model for the first differenced variables is specified and estimated.

$$\Delta SPR_t = \Im_0 + \sum_{i=1}^{P} \Im_{1i} \Delta SPR_{t-i} + \sum_{i=1}^{P} \Im_{2i} \Delta ERT_{t-i} + \mu_{1t} \qquad (3.5)$$

[52] For the purpose of performing Granger causality, the *VAR* model is specified with lag intervals of 1 through to 5.

$$\Delta ERT_t = \varphi_0 + \sum_{i=1}^{P} \varphi_{1i} \Delta ERT_{t-i} + \sum_{i=1}^{P} \varphi_{2i} \Delta SPR_{t-i} + \mu_{2t} \qquad (3.6)$$

Where *ERT* is log of nominal exchange rate and *SPR* is log of all-share stock market price indices including national, services, financials, industrials and technology indices. All data were obtained from data base of the Central Bank of Nigeria (CBN). The data are daily and spanned from 2000 through to 2012. The sample choice is informed by the fact that Nigeria during this period practiced the system of floating exchange rate.

Econometric Analysis

The unit root test results at level for the series on stock prices and exchange rate using the ADF and PP tests are reported in *Appendices A and B* respectively. The ADF test results indicate that the level series of stock prices and exchange rates are non-stationary processes at the one percent level with the test statistics -3.21026 and -2.02775 respectively. The PP test results indicate stationarity at level for only the series of the Naira-US$ exchange rate with a test statistic of -5.3359 as it compares satisfactorily with the one percent per cent critical value of -4.2712. Having differenced the series before subjecting them to stationarity test, the ADF and PP test results as presented in *Appendices C and D* respectively indicate that the first differenced series of stock prices and exchange rates are stationary processes at the one per cent level. For the stock price variable, the ADF and PP statistics are given by -5.762834 and -11.262252 respectively and these values compares satisfactorily with the one per cent critical value of -4.3942 and -4.3082 respectively. As for the exchange rate series, the ADF and PP test statistics are given by -7.700631 and -8.974995 respectively. These values also compares favorably with the one per cent critical value. In effect, both variables of stock prices and the Naira-Dollar exchange rate are first-difference stationary, that is, both variables are integrated of order one and abridged as *I(1).*

The Johansen co-integration results indicates one co-integrating relationship between stock prices and the Naira-US$ exchange rate. In particular, the trace statistic (39.865) and maximum eigenvalue statistic (25.666) are each greater than the five per cent and one per cent critical values respectively *(Appendix E).* Therefore, there is evidence that the linear combination of *I(1)* stock prices and the Naira-US$ exchange rate is *I(0),*co-integrated; an indication that the Nigerian stock exchange price level and the Naira-US$ exchange rate are into a long-run relationship. This indeed provide empirical evidence to validate the existence of a co-integrating relationship between stock prices and the Naira-US$ exchange rate.

The lag length criteria tests were undertaken for lengths of between 1 and 5 for the sample period (Appendix F). The results show that *LR, FPE, AIC, SIC and HQ* jointly selected five as the lag order. The lag exclusions tests are reported in Appendix G. based on the lag exclusion Wald test results, all lags except lag five are also rejected with a joint chi-square value of 9.925. Pair-wise Granger causality tests results of Granger-Sim causality at various lag lengths are provided in *Appendix H.* At one lag length, *uni-directional* causality is found at the five per cent level, with causality running from the Naira-US$ exchange rate to stock market prices with an F-statistic of 5.17724 and a significant probability value of 0.000. Meanwhile, the F-statistic for the test of causality running from stock prices to exchange rates at one-year lag is 0.19465, with an insignificance value of 0.268. At two lags, *uni-directional* causality from the Naira-US$ exchange rate to stock prices became more evident with a robust significance F-statistic of 9.53804 and a p value of 0.000. Beyond two-year lag, the empirical evidence of causality between exchange rate and stock market prices became mixed as the arrow of causation became dual. Indeed, for the three-year lag, the significance of the test for stock prices Granger-causing the Naira-US$ exchange rate became statistically robust as it stood at 5.09745 with a probability value of 0.00789, while the test of significance for the Naira-US$ exchange rate Granger-causing stock prices also proved to be statistically significant with an F-value of 3.33526 at the 5 per cent level. However, at the fourth lag, *uni-directional* causality from stock prices to the Naira-US$ exchange rate became significant and evident with an F-statistic of 8.28662 and a p-value of 0.005. Similarly at the four-day lag, the F-statistic for the test of causality running from the Naira-US$ exchange rate to stock prices is 6.35592 and it passes the significance test. This indeed re-enforces the bi-directional causality between stock prices and the Naira-US$ exchange rate in Nigeria. At the fifth day lag, the empirical evidence of a bi-directional causality between stock prices and the Naira-US$ exchange rate for a third time resurfaced. The results thus portrays the fact that whenever there is a change in the Naira-US$ exchange rate, stock prices react in tandem. in reality, the results portrays that five days are enough for the Nigerian financial market to be highly integrated given efficient flow of information amongst market investors that allows them to react rapidly to developments in both the exchange rate and stock exchange markets.

Appendix I presents the plots of *cusum and the cusum squares* for the regression of stock prices on the Naira-US$ exchange rate shows stability[53] of results and hence, absence of structural break. Such stability of estimates cannot be said for the regression of the Naira-US$ exchange rate on stock market prices. *Appendix J* presents the test results for heteroskedasticity for

[53]Stability test results for the regression of the Naira-US$ exchange rate on stock market capitalization are not reported since they are not economically viable.

the regression of stock prices on the Naira-US$ exchange rate. Regressing stock prices on the value of the naira, the F-statistic is 0.421763 and the LM statistic is 0.904478 with p-values of 0.659848 and 0.636202 respectively. In the regression of exchange rate on stock prices in Nigeria, the F-statistic is 0.358117 and the LM statistic is 2.121305 with p-values of 0.871203 and 0.832118 respectively. This provides evidence in support of the null hypothesis that there is no ARCH up to order five in the residuals of the regression of stock prices on the Naira-US$ exchange rate. The serial correlation test results as presented in *Appendix K*. In the regression of the Naira-US$ exchange rate on stock prices, the residuals are found to be heteroskedasticity as made evident by a significant F-statistic of 5.646136 and LM statistic of 7.925862 respectively but the residuals are not serially correlated in the regression of stock prices on exchange rate of the naira given the low values of the F and LM statistics of 0.604575 and 1.40524 respectively. In the core, there are no traces of serial correction in the error component of the regression of stock prices on the Naira-US$ exchange rate. These are pointer to the fact that valid statistical inference on the relationship between stock market and the US$ exchange rate is discernible when stock price serve as dependent variable. In effect, the regression for stock prices performed better than that of the exchange rate of the naira and hence may be relied upon for forecasting the relationship between exchange rate variability and stock prices in Nigeria.

The policy implication is uncomplicated, causality is two-way, running from the Naira-US$ exchange rate to all-market share prices and also from stock prices to Naira-US$ exchange rate. These simultaneously suggest a relationship to uphold the predictions of the flow and stock theories. In effect, while stock price movements influence exchange rate, the Naira-US$ exchange rate also determines the movement of stock prices in Nigeria. The policy implication of the mixed evidence found in this study can be explained thus: Exchange rate changes affect the competitiveness of firms through their impact on input and output price (Joseph, 2002). Given that the Naira-US$ exchange rate appreciation reduces the competitiveness of Nigerian goods in international market, Nigerian export looses value in the international market, income is minimized and stock prices falls. In a similar vein, when the Naira-US$ exchange rate depreciates, Nigerian exporters tends to benefit as a result of the increase in exports sales revenue and hence, their stock prices will rise.

Synthesis Of Econometric Evidence

The mixture of causality evidence from the Naira-US$ exchange rate to stock prices in the Nigerian Stock Market and vice versa of the present study corroborates the studies of Bahmani-Oskooee and Sohrabian (1992), Yu Qiao (1997) Ajayi et al (1998), Granger et al (2000), Wu (2000), Ramasamy and Yeung (2005) and Yau and Nieh (2006). Accordingly, it is evident that both theories of flow and stock models are supported simultaneously for the Nigerian economy as it relates to exchange rate movement and stock price response.

Conlcusion And Policy Recommendation

This study examines the interaction between stock prices and exchange rate in Nigeria using co-integration and the Granger-Sim causality. The study finds a significant *bi-directional* causal relationship between the Naira-US$ exchange rate movement and the reaction of stock prices. In other words, the Naira-US Dollar exchange rate Granger causes stock prices and stock price movement also Granger causes the Naira-US$ exchange rate. Although, there is evidence of uni-directional causality running from the Naira-US$ exchange rate to all-share price index, the instantaneous incidence of reverse causality for most part of the analysis is a pointer to mix empirical evidence. The present empirics also provides evidence of a positive co-integrating relationship between the Naira-US$ exchange rate movement and the activities of the Nigerian Stock Exchange Market. So to speak, the results portray the fact that whenever there is a change in the Naira-US$ exchange rate, stock prices react in tandem. In effect, the results lend empirical support to the fact that exchange rate movement and the Nigerian Stock Exchange Market interact in a manner that is simultaneously consistent with the predictions of the flow and stock theories, that is to say, changes in stock prices cause changes in the Naira-US Dollar exchange rate and changes in the Naira-US$ exchange rate cause changes in stock prices. The government should therefore implement policies that would enhance the activities of the Nigerian financial market.

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APPENDIX A: ADF Unit Root Test Results

Level Series Regression for LN (SPR)

ADF Test Statistic	-3.210257	1% Critical Value*	-4.3382
		5% Critical Value	-3.5867
		10% Critical Value	-3.2279

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNSPR)
Method: Least Squares

Sample (adjusted):

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNSPR(-1)	-0.287418	0.086827	-3.310257	0.0037
D(LNSPR(-1))	-0.198313	0.211612	-0.937153	0.3604
D(LNSPR(-2))	0.045896	0.179865	0.255172	0.8013
D(LNSPR(-3))	0.347817	0.176583	1.969712	0.0636
D(LNSPR(-4))	0.457092	0.176531	2.589295	0.0180
D(LNSPR(-5))	0.281764	0.194897	1.445712	0.1646
C	-1.921587	2.657426	-0.723101	0.4784
@TREND(1970)	1.072431	0.390387	2.747097	0.0128
R-squared	0.531309	Mean dependent var		3.114815
Adjusted R-squared	0.358633	S.D. dependent var		4.804221
S.E. of regression	3.847480	Akaike info criterion		5.773909
Sum squared resid	281.2589	Schwarz criterion		6.157860
Log likelihood	-69.94776	F-statistic		3.076914
Durbin-Watson stat	1.978124	Prob(F-statistic)		0.024149

Level Series Regression for LN (ERT)

ADF Test Statistic	-2.027751	1% Critical Value*	-4.3382
		5% Critical Value	-3.5867
		10% Critical Value	-3.2279

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNERT)
Method: Least Squares

Sample(adjusted):

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNERT(-1)	-1.153184	0.568701	-2.027751	0.0568
D(LNERT(-1))	0.129799	0.512233	0.253398	0.8027
D(LNERT(-2))	0.107651	0.454297	0.236962	0.8152
D(LNERT(-3))	0.085520	0.391783	0.218284	0.8295
D(LNERT(-4))	0.060010	0.319461	0.187846	0.8530
D(LNERT(-5))	0.031145	0.226000	0.137811	0.8918
C	531.0004	377.9905	1.404798	0.1762
@TREND(1970)	-2.823356	16.62653	-0.169810	0.8670

R-squared	0.514834	Mean dependent var	7.137407
Adjusted R-squared	0.336089	S.D. dependent var	807.2700
S.E. of regression	657.7696	Akaike info criterion	16.05678
Sum squared resid	8220557.	Schwarz criterion	16.44073
Log likelihood	-208.7665	F-statistic	2.880266
Durbin-Watson stat	2.015123	Prob(F-statistic)	0.031440

APPENDIX B: PP Unit Root Test Results

Level Series Regression for LN (SPR)

PP Test Statistic	-2.535221	1% Critical Value*	-4.2712
		5% Critical Value	-3.5562
		10% Critical Value	-3.2109

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 5	(Newey-West suggests: 3)	
Residual variance with no correction		18.44502
Residual variance with correction		24.11823

Phillips-Perron Test Equation
Dependent Variable: D(LNSPR)
Method: Least Squares

Sample(adjusted):

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNSPR(-1)	-0.150985	0.057408	-2.630061	0.0135
C	-0.455184	1.638449	-0.277814	0.7831

@TREND(1986)	0.697616	0.210857	3.308483	0.0025

R-squared	0.289974	Mean dependent var	2.362500
Adjusted R-squared	0.241007	S.D. dependent var	5.178414
S.E. of regression	4.511444	Akaike info criterion	5.940172
Sum squared resid	590.2407	Schwarz criterion	6.077584
Log likelihood	-92.04274	F-statistic	5.921799
Durbin-Watson stat	1.724730	Prob(F-statistic)	0.006974

Level Series Regression for LN (ERT)

PP Test Statistic	-5.335902	1% Critical Value*	-4.2712
		5% Critical Value	-3.5562
		10% Critical Value	-3.2109

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 5	(Newey-West suggests: 3)	
Residual variance with no correction		266792.9
Residual variance with correction		254843.4

Phillips-Perron Test Equation
Dependent Variable: D(LNERT)
Method: Least Squares

Sample(adjusted):

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNERT(-1)	-0.990708	0.185471	-5.341568	0.0000
C	294.6831	202.3921	1.456001	0.1561
@TREND(1970)	4.643026	10.45342	0.444163	0.6602

R-squared	0.496139	Mean dependent var	7.795938
Adjusted R-squared	0.461390	S.D. dependent var	739.3092
S.E. of regression	542.5792	Akaike info criterion	15.51961
Sum squared resid	8537374.	Schwarz criterion	15.65702
Log likelihood	-245.3137	F-statistic	14.27780
Durbin-Watson stat	2.003230	Prob(F-statistic)	0.000048

APPENDIX C: ADF Unit Root Test Results

Difference Series Regression for LN (SPR)

ADF Test Statistic	5.762834	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNSPR,2)
Method: Least Squares
Date: 01/09/13 Time: 13:42
Sample(adjusted): 2000 2012

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNSPR(-1))	5.070215	6.646555	5.762834	0.4567
D(LNSPR(-1),2)	-5.328972	6.691777	-0.796346	0.4375
D(LNSPR(-2),2)	-6.496053	6.903924	-0.940922	0.3607
D(LNSPR(-3),2)	-6.160564	7.008228	-0.879047	0.3924
D(LNSPR(-4),2)	-7.319173	7.980415	-0.917142	0.3727
D(LNSPR(-5),2)	-6.467892	8.422067	-0.767970	0.4537
C	-20702.13	17553.95	-1.179343	0.2555
@TREND(1970)	1593.994	1140.761	1.397307	0.1814
R-squared	0.792780	Mean dependent var		7194.783
Adjusted R-squared	0.702121	S.D. dependent var		42575.03
S.E. of regression	23236.72	Akaike info criterion		23.20606
Sum squared resid	8.64E+09	Schwarz criterion		23.59874
Log likelihood	-270.4727	F-statistic		8.744656
Durbin-Watson stat	2.051138	Prob(F-statistic)		0.000182

Difference Series Regression for LN (ERT)

ADF Test Statistic	-7.700631	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNERT,2)
Method: Least Squares
Date: 01/09/13 Time: 13:46
Sample(adjusted): 2000 2012

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNERT(-1))	-3.386638	1.254017	-7.700631	0.0158
D(LNERT(-1),2)	1.770561	1.133122	1.562550	0.1377
D(LNERT(-2),2)	1.445529	0.999861	1.445730	0.1676
D(LNERT(-3),2)	1.205364	0.838920	1.436804	0.1700
D(LNERT(-4),2)	0.740592	0.601914	1.230396	0.2363
D(LNERT(-5),2)	0.373205	0.310493	1.201978	0.2469
C	-2722.790	1850.665	-1.471250	0.1606
@TREND(1970)	229.1454	106.2575	2.156512	0.0466
R-squared	0.758322	Mean dependent var		215.8125
Adjusted R-squared	0.652588	S.D. dependent var		4922.972
S.E. of regression	2901.680	Akaike info criterion		19.04517
Sum squared resid	1.35E+08	Schwarz criterion		19.43785
Log likelihood	-220.5420	F-statistic		7.171981
Durbin-Watson stat	2.178989	Prob(F-statistic)		0.000566

APPENDIX D: PP Unit Root Test Results

Difference Series Regression for LN (SPR)

PP Test Statistic	-11.262252	1% Critical Value*	-4.3082
		5% Critical Value	-3.5731
		10% Critical Value	-3.2203

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 5	(Newey-West suggests: 3)	
Residual variance with no correction		1.14E+09
Residual variance with correction		7.18E+08

Phillips-Perron Test Equation
Dependent Variable: D(LNSPR,2)
Method: Least Squares
Date: 01/09/13 Time: 13:48
Sample(adjusted): 2000 2012

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNSPR(-1))	-0.589804	0.256395	-11.300371	0.0297
C	-18266.76	14641.20	-1.247627	0.2233
@TREND(1970)	1895.401	872.7545	2.171746	0.0392

R-squared	0.213007	Mean dependent var	5958.183
Adjusted R-squared	0.152469	S.D. dependent var	38685.29
S.E. of regression	35614.23	Akaike info criterion	23.89658
Sum squared resid	3.30E+10	Schwarz criterion	24.03802
Log likelihood	-343.5003	F-statistic	3.518575
Durbin-Watson stat	1.189192	Prob(F-statistic)	0.044424

Difference Series Regression for LN (ERT)

PP Test Statistic	-8.974995	1% Critical Value*	-4.3082
		5% Critical Value	-3.5731
		10% Critical Value	-3.2203

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 5	(Newey-West suggests: 3)	
Residual variance with no correction		5682333.
Residual variance with correction		3236588.

Phillips-Perron Test Equation
Dependent Variable: D(LNERT,2)
Method: Least Squares
Date: 01/09/13 Time: 13:50
Sample(adjusted): 2000 2012

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNERT(-1))	-1.442275	0.183539	-7.858122	0.0000
C	-898.5697	1011.710	-0.888169	0.3826

@TREND(1970)	104.4876	56.67401	1.843660	0.0767
R-squared	0.704676	Mean dependent var		176.9207
Adjusted R-squared	0.681959	S.D. dependent var		4464.100
S.E. of regression	2517.536	Akaike info criterion		18.59765
Sum squared resid	1.65E+08	Schwarz criterion		18.73909
Log likelihood	-266.6659	F-statistic		31.01946
Durbin-Watson stat	2.117072	Prob(F-statistic)		0.000000

APPENDIX E: Johansen Co-integration Test Results

Hypothesized No. of CE	Eigenvalue	λ_{trace}	λ_{Max}	5% CV	1% CV	Inference
None**	0.488189	39.865	25.666	15.45	20.04	Co-integrated*
At most 1	0.066620	1.8456	3.355	3.76	6.65	Absent
* denotes that Trace and Max-eigenvalue tests indicate one co-integrating equation @ both 5% and 1% levels						

APPENDIX F: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	6435.67	NA	6.45	-5.25	-6.73	-4.63
1	9729.23	9.362	1.55	-13.25	-13.43*	-13.33*
2	9876.55	5.838	1.56*	-13.35	-13.45*	-13.95*
3	9935.23	9.267*	1.56	-13.56	-13.66	-13.43
4	9533.65	5.539	1.53	-13.83	-13.44	-13.56
5	9879.55	5.563*	1.55*	-13.66*	-13.43*	-13.55*
* indicates lag order selected by the criterion, LR: sequential modified LR test statistic, FPE: Final Prediction Error, AIC: Akaike Information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion						

APPENDIX G: VAR Lag Exclusion WALD Test Results

	D(ERT)	D(SPR)	Joint
Lag 1	3.673 [0.078]	1.756 [0.357]	2.275 [0.134]
Lag 2	0.027 [0.826]	3.035 [0.327]	1.365 [0.854]
Lag 3	5.234 [0.053]	1.823 [0.135]	5.279 [0.199]
Lag 4	1.335 [0.530]	2.293 [0.257]	4.539 [0.298]
Lag 5	2.029 [0.233]	4.542 [0.622]	9.925* [0.000]
Degree of freedom	3	3	6
Note: Chi-squared test statistics for lag exclusion, Values in [] are p-values			

APPENDIX H: Granger-Sim Causality Test Results

Pair wise Granger Causality Tests
Sample: 4,464
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Probability
D(LNSPR) does not Granger Cause D(LNERT)	463	0.19465	0.666246
D(LNERT) does not Granger Cause D(LNSPR)		5.17724	0.000007

Pair wise Granger Causality Tests
Sample: 4,464
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
D(LNSPR) does not Granger Cause D(LNERT)	462	1.05163	0.53692
D(LNERT) does not Granger Cause D(LNSPR)		9.53804	0.00000

Pair wise Granger Causality Tests

Sample: 4,464
Lags: 3

Null Hypothesis:	Obs	F-Statistic	Probability
D(LNSPR) does not Granger Cause D(LNERT)	461	5.09745	0.00789
D(LNERT) does not Granger Cause D(LNSPR)		3.33526	004872

Pair wise Granger Causality Tests

Sample: 4,464
Lags: 4

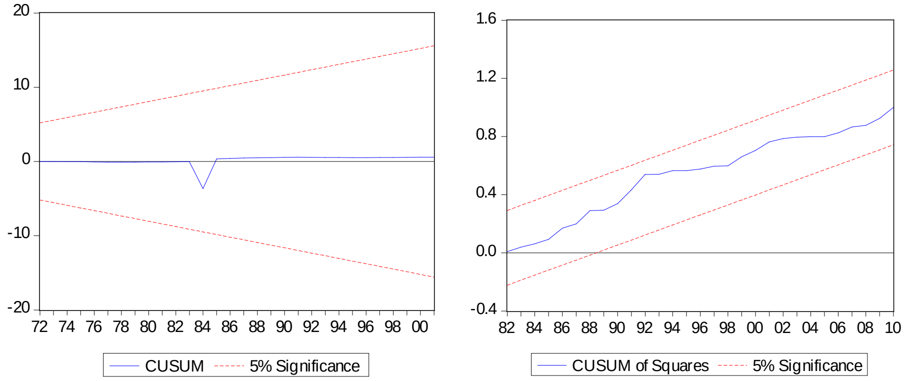
Null Hypothesis:	Obs	F-Statistic	Probability
D(LNSPR) does not Granger Cause D(LNERT)	460	8.29662	0.00000
D(LNERT) does not Granger Cause D(LNSPR)		6.35592	0.00009

Pair wise Granger Causality Tests

Sample: 4,464
Lags: 5

Null Hypothesis:	Obs	F-Statistic	Probability
D(LNSPR) does not Granger Cause D(LNERT)	459	6.87471	0.00033
D(LNERT) does not Granger Cause D(LNSPR)		10.3266	0.00000

APPENDIX I: Stability Test Results, CUSUM and CUSUMSQ



APPENDIX J: Test for Heteroskedasticity

ARCH –LM Test: OLS Regression of D(LNSPR) on D(LNERT)

F-statistic	0.358117	Probability	0.871203
Obs*R-squared	2.121305	Probability	0.832118

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares

Sample(adjusted):

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	32.48934	15.47219	2.099853	0.0480
RESID^2(-1)	-0.011059	0.220948	-0.050054	0.9606
RESID^2(-2)	-0.210305	0.220533	-0.953622	0.3511
RESID^2(-3)	-0.107164	0.225787	-0.474625	0.6400
RESID^2(-4)	0.061483	0.209514	0.293457	0.7721
RESID^2(-5)	-0.143299	0.212419	-0.674604	0.5073

R-squared	0.078567	Mean dependent var	22.78863
Adjusted R-squared	-0.140822	S.D. dependent var	40.80273
S.E. of regression	43.58109	Akaike info criterion	10.58025
Sum squared resid	39885.55	Schwarz criterion	10.86822
Log likelihood	-136.8334	F-statistic	0.358117
Durbin-Watson stat	1.995319	Prob(F-statistic)	0.871203

ARCH –LM Test: OLS Regression of D(LNERT) on D(LNSPR)

F-statistic	2.741444	Probability	0.046578
Obs*R-squared	10.66334	Probability	0.058479

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares

Sample(adjusted):

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	403820.4	426819.9	0.946114	0.3549
RESID^2(-1)	0.784495	0.216688	3.620397	0.0016
RESID^2(-2)	-0.664889	0.266482	-2.495061	0.0210
RESID^2(-3)	0.450537	0.287051	1.569537	0.1315
RESID^2(-4)	-0.331946	0.266482	-1.245658	0.2266
RESID^2(-5)	0.118230	0.216687	0.545625	0.5911

R-squared	0.394939	Mean dependent var	627471.4
Adjusted R-squared	0.250876	S.D. dependent var	2259630.
S.E. of regression	1955753.	Akaike info criterion	32.00358
Sum squared resid	8.03E+13	Schwarz criterion	32.29154
Log likelihood	-426.0483	F-statistic	2.741444
Durbin-Watson stat	1.954936	Prob(F-statistic)	0.046578

White Heteroskedasticity Test: OLS Regression of D(LNSPR) on D(LNERT)

F-statistic	0.421763	Probability	0.659848
Obs*R-squared	0.904478	Probability	0.636202

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares

Sample Adjsuted:

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	27.70831	7.531720	3.678882	0.0009
DLNERT	0.000403	0.010022	0.040234	0.9682
DLNERT^2	-3.27E-06	3.56E-06	-0.918117	0.3661

R-squared	0.028265	Mean dependent var	25.97557
Adjusted R-squared	-0.038751	S.D. dependent var	40.47053
S.E. of regression	41.24722	Akaike info criterion	10.36610
Sum squared resid	49338.66	Schwarz criterion	10.50352
Log likelihood	-162.8577	F-statistic	0.421763
Durbin-Watson stat	1.826387	Prob(F-statistic)	0.659848

White Heteroskedasticity Test: OLS Regression of D(LNERT) on D(LNSPR)

F-statistic	0.429727	Probability	0.654763
Obs*R-squared	0.921067	Probability	0.630947

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares

Sample Adjusted:

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	684272.6	441879.9	1.548549	0.1323
DLNSPR	-54103.93	97039.14	-0.557548	0.5814
DLNSPR^2	-8955.961	9680.834	-0.925123	0.3625

R-squared	0.028783	Mean dependent var	529448.6

Adjusted R-squared	-0.038197	S.D. dependent var	2082294.
S.E. of regression	2121691.	Akaike info criterion	32.06238
Sum squared resid	1.31E+14	Schwarz criterion	32.19980
Log likelihood	-509.9982	F-statistic	0.429727
Durbin-Watson stat	0.962650	Prob(F-statistic)	0.654763

APPENDIX K: Test for Serial Correlation

B-G Serial Correlation LM Test: OLS Regression of D(LNERT) on D(LNSPR)

F-statistic	5.646136	Probability	0.00003
Obs*R-squared	7.925862	Probability	0.00000

Test Equation:
Dependent Variable: RESID
Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.104433	0.886386	0.117818	0.9072
DLNERT	-0.001333	0.001888	-0.706007	0.4867
RESID(-1)	0.217876	0.270900	0.804267	0.4288
RESID(-2)	-0.198276	0.288185	-0.688016	0.4978
RESID(-3)	0.299612	0.213612	1.402603	0.1730
RESID(-4)	0.299014	0.213893	1.397960	0.1744
RESID(-5)	0.036639	0.216219	0.169452	0.8668

R-squared	0.247683	Mean dependent var	-3.89E-16
Adjusted R-squared	0.067127	S.D. dependent var	5.178174
S.E. of regression	5.001357	Akaike info criterion	6.247936
Sum squared resid	625.3394	Schwarz criterion	6.568565
Log likelihood	-92.96697	F-statistic	1.371780
Durbin-Watson stat	1.756769	Prob(F-statistic)	0.264358

B-G Serial Correlation LM Test: OLS Regression of D(LNSPR) on D(LNERT)

F-statistic	0.604575	Probability	0.893638
Obs*R-squared	1.40524	Probability	0.569863

Test Equation:
Dependent Variable: RESID
Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-51.40547	123.7618	-0.415358	0.6814
DLNSPR	-21.39209	23.17398	-0.923108	0.3648
RESID(-1)	-0.847033	0.199538	-4.244980	0.0003
RESID(-2)	-0.677297	0.252327	-2.684203	0.0127

RESID(-3)	-0.479196	0.260322	-1.840780	0.0776
RESID(-4)	-0.321423	0.246372	-1.304625	0.2039
RESID(-5)	-0.188892	0.200970	-0.939906	0.3563

R-squared	0.418914	Mean dependent var	-7.13E-15
Adjusted R-squared	0.279453	S.D. dependent var	739.2750
S.E. of regression	627.5339	Akaike info criterion	15.91211
Sum squared resid	9844969.	Schwarz criterion	16.23274
Log likelihood	-247.5938	F-statistic	3.003813
Durbin-Watson stat	1.907940	Prob(F-statistic)	0.023775